

DOCUMENT RESUME

ED 155 061

SE 024 356

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TITLE Investigating Passively Floating and Weakly Swimming
Organisms: An Activity for Beginning Marine Education
Students.
PUB DATE 78
NOTE 12p.
EDRS PRICE MF-\$0.83 HC-\$1.67 Plus Postage.
DESCRIPTORS Biological Sciences; Biology; *College Science;
Course Descriptions; Earth Science; Higher Education;
*Marine Biology; *Oceanology; Science Education;
*Science Units

ABSTRACT

This document presents the outline of a marine biology science unit designed to introduce students to the study and collection of plankton. Extensive details on plankton collections and a seven-item quiz are included. (SL)

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INVESTIGATING PASSIVELY FLOATING AND WEAKLY SWIMMING ORGANISMS:
AN ACTIVITY FOR BEGINNING MARINE EDUCATION STUDENTS

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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Summer 1978

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INTRODUCTION

Passively floating or weakly swimming organisms are known to many of us by the name plankton. These small and sometimes microscopic organisms live in the ocean near its surface (usually below the depth of light penetration). They are both plants and animals and some spend all, while others spend only a short portion of their lives, as planktonic organisms.

Planktonic plants and animals are tremendously important to both ocean or marine life and life on land. The plants among this group capture the sun's energy and use it and carbon dioxide from the water to manufacture sugar for their own use. A bi-product of this process is oxygen, which they release to the surrounding sea water. The carbon dioxide they use is in the sea water (to a large extent) as a result of the breathing of fishes and other marine creatures. The oxygen produced by these plants is available for marine animals to breath and for other chemical processes which take place in the sea. This free oxygen, which, incidentally, is produced in tremendous volumes, is also liberated to the atmosphere at the sea's surface. In fact, some researchers estimate that as much as 70% of the earth's renewable oxygen supply is produced by these marine plants.

The plant members of the plankton community enjoy further importance because they are at the bottom of what we call the food chain. They are the food for many members of the animal plankton community. The animals which feed upon these passively floating plants are in turn fed upon by other larger marine animals, and so the story goes.

This fascinating and complicated sequence of events continues endlessly - plant capturing the sun's energy and converting it to useful body fuel and parts - animal eating plant - and animal eating animal. Without the planktonic organisms

the ocean would probably die, and perhaps, eventually, man also.

While this description is an oversimplification, it does point to a need for us to know and understand this group of organisms.

The primary purpose of this exercise is to introduce students to these organisms and methods of collecting them.

OBJECTIVES

As a result of participation in this activity, the student should be able to:

1. Build an inexpensive plankton net.
2. Conduct a plankton tow.
3. Recognize magnified planktonic organisms.

DISCUSSION

The investigation may be conducted using a commercially produced plankton net or one that is constructed by the investigator. The plans and instructions for constructing the homemade net are included below. First, however, a note concerning mesh size. Whether one uses a commercially produced net or a homemade variety, the mesh size of the material used in the net will determine the size and quantity of the organisms captured.

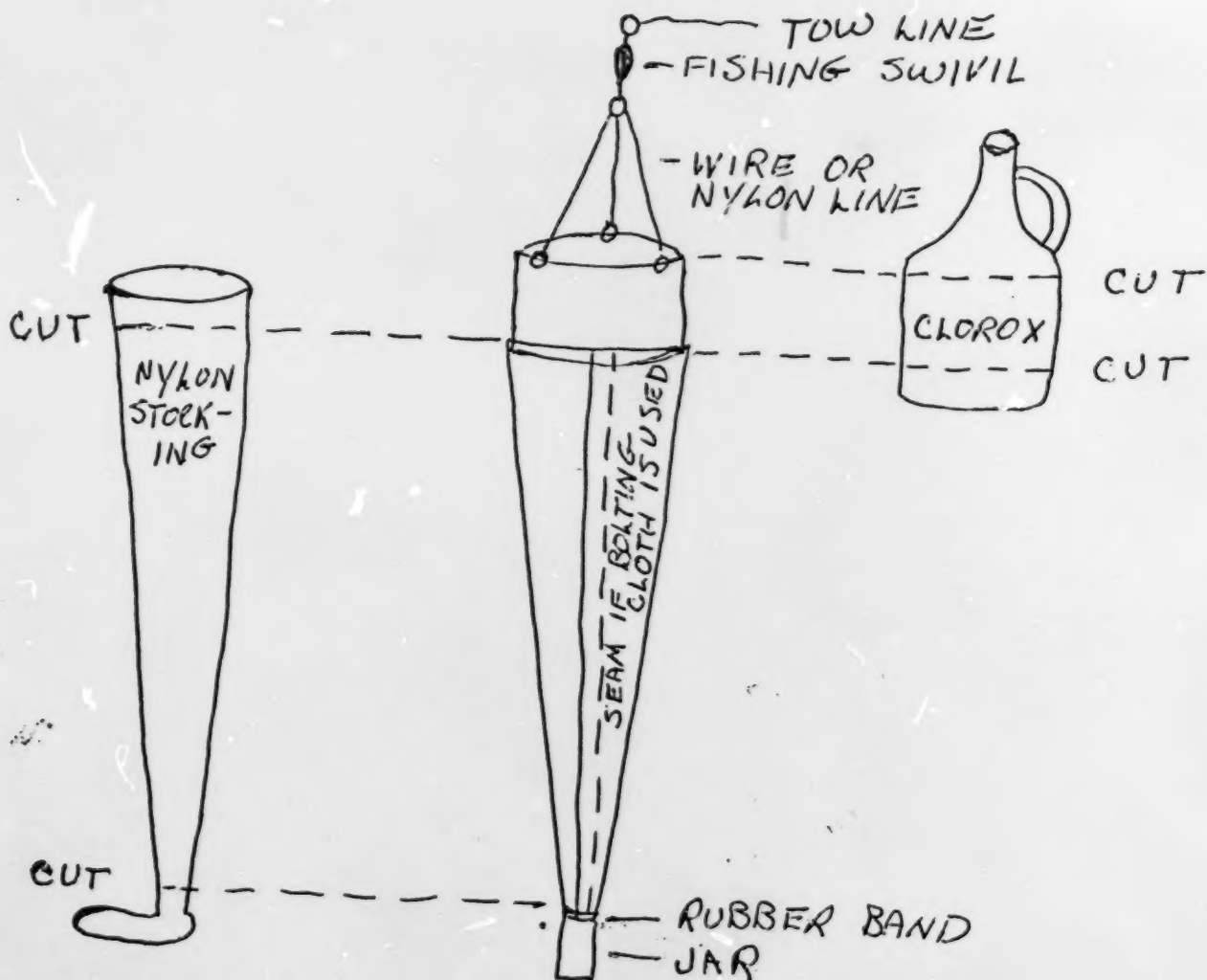
Figure #1. A Generalized Picture
of a Plankton Net.



An inexpensive plankton net may be constructed using the following materials: a nylon stocking or piece of bolting cloth, a baby food or other small jar (plastic or glass), a clorox bottle, a rubberband or piece of marlin, a small fishing

swivel, some waterproof glue, three pieces of stranded copper wire or 1/16" nylon line, some thread, and a needle. See Figure #2.

Figure #2. Homemade Plankton Net.



The clorox bottle is cut just above the bottom and just below the handle, and the nylon stocking is cut so as to accommodate the plastic ring from the clorox bottle, and the top of the glass or plastic jar. Three holes must be punched in the clorox ring in order that it be able to accommodate the stranded wire or the nylon line (this can be accomplished with a nail). Then glue the nylon stocking or bolting cloth to the clorox bottle ring.

If bolting cloth is used the seam must be sewn. In this case you should make sure the stitches are small and close together. This is especially important since many planktonic organisms are actually washed down the sides of the net and into the collecting bottle while the water passes through the net. Large open areas along the seam will serve only to allow the loss of some of these organisms.

The fish swivel serves as a pivot point. The net lines are attached at the bottom of the swivel and a tow line is attached at the top. This arrangement allows the net to revolve freely and prevents it from becoming tangled and twisted.

Marlin (waterproof nonstretchable string) or rubber bands are used to fasten the bottle to the net. This is done in order to allow quick and easy removal of the jar after a tow has been made. An alternative to this method of fastening is to use a jar with a plastic screw top. The very top of the top must be cut out. After the top of the top has been removed, the remaining ring can be glued in place. Then the jar could be screwed into the ring when it was to be used. This method of construction is time consuming but allows quick removal of the collecting jar.

If you have chosen to construct your own net rather than using a commercial model, you are now ready to begin the collection portion of the activity.

The most important factor to have present when making plankton tows is moving water. If the water is not moving, then it is up to the tower, investigator,

or student to make it move. This can be done by several methods. The most obvious, and that method used by marine science researchers, is to tow the net behind a moving vessel. However, this method is not practical for our purposes. If moving water is not available it is necessary to locate a spot where you can walk and tow the net at one side of your body. A boat dock or pier is well suited for such a tow.

Once the proper towing spot is located the net may be dropped into the water. A sufficient length of tow line should be paid out so that the clorox ring is in the water. If a current is running the tower may allow the current to carry the net while he or she remains stationary. On the other hand, if it is decided to tow, the tow should be made against the current if a current is running.

The number of organisms collected will depend upon the length of time the net is in the water. If a tow is made over a distance of 10 to 20 meters, and there is little water movement, it is wise to make 4 to 5 tows over that length before the sample bottle is removed. If a current is running it is wise to allow the net out for 10 to 15 minutes before it is retrieved and the sample bottle removed.

Recall that many of the planktonic organisms are washed down the sides of the net. When the net is retrieved many may still be clinging to the sides of the net. Therefore, it is wise to rinse the sides of the net prior to removing the sample bottle. This can be accomplished by pouring some sea water through the clorox ring opening.

Once the sample bottle has been removed the sample is ready to be studied. This can be accomplished by using a hand lens (10 power or 10X should be sufficient). However, the use of dissecting or binocular microscope is preferred. Whatever the magnifying device, a portion of the sample should be poured into a small, clear glass or plastic dish. Then active study of the planktonic creatures can proceed.

MATERIALS

1. One commercially produced plankton net or the following list of parts so that one may be prepared:
 - a. One clorox bottle.
 - b. One fishing swivel.
 - c. Three pieces of stranded wire or 1/16 inch of nylon line.
 - d. One nylon stocking or a sufficient quantity of bolting cloth.
 - e. One needle.
 - f. A spool of thread.
 - g. One small jar.
 - h. A rubber band or a length of hemp.
 - i. A tube of waterproof glue.
 - j. A length of tow line.
2. One hand lens (10 power or 10X).
3. One dissecting or binocular microscope.
4. Two small, clear glass or plastic dishes.
5. Keys and other text books devoted to the subject of plankton.

PROCEDURES

1. Procure or build a plankton net.
2. Make one or more plankton tows.
3. Examine the planktonic creatures under a microscope or hand lens.
4. Compare the organisms you have gathered during your tow with those found in available guides and text books.
5. Make some rough sketches of the organisms you have captured. These sketches may be of use as you reflect upon your intelligent beachcombing experience. Use the space provided below and on the following page for these drawings.

6. Answer the following questions:

- a. What is the meaning of the term plankton? _____

- b. Where are planktonic organisms found? _____

- c. Planktonic organisms are said to be important to both man and marine life. If this statement is true, why is it true? _____

- d. What types of organisms make up the planktonic community? _____

- e. How are planktonic organisms captured? _____

- f. How does one ensure that small as well as large planktonic organisms are captured? _____

- g. Do planktonic organisms have characteristic shapes? _____

You may find the answers to these questions by consulting Appendix A.

REFERENCES

Pletcher, T. F. Plankton Nets From Plastic Bottles. *American Biology Teacher*, 1968, 30, 186-188.

SUGGESTIONS FOR FURTHER STUDY

1. Identify the planktonic by scientific name.
2. Relate the quantity and types of organisms to the time of day when they were caught.
3. Relate the quantity and types of organisms caught to the time of year.
4. Relate the types of organisms caught to the areas in which they are caught (an area which has fresh water flowing into it vs. one that is only salt, etc.).

APPENDIX A

ANSWERS TO QUESTIONS FOUND IN THE PROCEDURES SECTION

- 6a. The term plankton means passively floating or free-swimming organisms.
- b. Planktonic organisms are found in the upper or surface areas of the ocean, especially to the depth that light penetrates the ocean.
- c. Planktonic organisms are thought to provide as much as 70% of the earth's renewable air supply and they are the bottom of the marine food chain.
- d. Plants and animals.
- e. With plankton nets.
- f. By using a plankton net of very fine mesh.
- g. No, there are almost an infinite variety of shapes.